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80-10142

CR-143/60

(E80-10142) HCMM IMAGERY FOR THE
DISCRIMINATION OF ROCK TYPES, THE DETECTION
OF GEOTHERMAL ENERGY SOURCES AND THE
ASSESSMENT OF SOIL MOISTURE CONTENT IN
WESTERN QUEENSLAND AND ADJACENT PARTS OF NEW G3/43

N80-26729

Unclas
00142

HCMM Imagery for the Discrimination of Rock
Types, the Detection of Geothermal Energy
Sources and the Assessment of Soil Moisture
Content in western Queensland and adjacent
parts of New South Wales and South Australia

HCM-022

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Progress Report: 28 February 1980

RECEIVED

APR 8 1980

SIS/902.6

HCM 022
TYPE II

HCMM imagery for the discrimination of rock types, the detection of geothermal energy sources and the assessment of soil moisture content in western Queensland and adjacent parts of New South Wales and South Australia.

HCM-022

By : Monica M. Cole

Introduction

Investigations of the HCMM imagery are focussed on the Mount Isa - Cloncurry area of northwest Queensland for which LANDSAT imagery has already been evaluated. The main purpose of the investigations in this area is the discrimination of rock type within the upland country underlain by Precambrian rocks and the plains underlain by Mesozoic and later sediments. Investigations of the HCMM imagery for the detection of geothermal energy sources is focussed on the Great Artesian Basin and those concerned with the discrimination of differences in soil moisture conditions is being undertaken within the drainage basins focussing on the Gulf of Carpentaria and on Lake Eyre.

Techniques

Only photographic prints and negative films of day-visible, day-IR and night-IR imagery has been received. For northwest Queensland only five day-visible and day-IR frames of acceptable quality have been received. A master-grid has been established over these frames within which selected grid sections are being enlarged photographically for the identification of stream courses and geological features permitting an interpretation of the imagery relative to ground truth information. The imagery is also being scanned and digitized using a Joyce-Loebl microdensitometer for classification purposes. When satisfactory night-IR cover is received it is proposed to construct thermal inertia models.

Accomplishments

The HCMM imagery is being investigated with reference to existing ground truth information. It is hoped to obtain additional ground truth information for those areas for which it is not available during the May to August period 1980.

Accomplishments have been constrained by delays over the supply of data products and by the poor quality of much of the imagery which has been received. Investigations of the good-quality day-visible and day-IR imagery of northwest Queensland recently received shows that large scale geological features like the Mitakoodi anticlinorium, which involves rocks of contrasting lithological type, are clearly delineated. North of Cloncurry the contrasting lithological units of the Knapdale quartzite and bedded argillaceous limestones within the Proterozoic Corella sequence are clearly discriminated in the area of the Dugald River Lode. Major structural features in the Mount Isa area are clearly delineated on the day-visible cover. The day-visible imagery, as to be anticipated, provides similar but less detailed information than the LANDSAT imagery. The day-IR cover provides less additional information for areas of outcropping bedrock than had been expected. Initial studies of the day-IR and night-IR cover for parts of South Australia familiar to the Investigator suggest that they contain considerable additional information on geology compared with the day-visible cover. For further evaluation of this area which forms part of Study Areas 2 and 3 LANDSAT cover is needed.

Preliminary studies show that changes in the drainage systems respectively focussing on Lake Eyre and on the Gulf of Carpentaria can be monitored by sequential monthly imagery. This imagery is now being studied in greater detail. This would be facilitated by the provision of LANDSAT imagery and additional ground truth information.

Significant results

Studies of the day-visible and day-IR imagery of the Mount Isa - Cloncurry area have shown that large-scale geological features like

the Mitakoodi anticlinorium involving rocks of contrasting lithological type, can be identified. Studies of the imagery for the plains area south of Duchess and draining towards Lake Eyre has revealed that the day-IR cover discloses former drainage channels which are quite distinct from the larger and current drainage channels seen on the day-visible cover. It is believed that the revelation of these former drainage channels is due to higher moisture contents, finer soil/alluvial material and possibly differing plant communities along them. The identification of these former channels, which are persistent on sequential imagery, is considered to be of importance for the interpretation of geochemical results in this type of terrain.

Publications

A paper entitled "HCMM and LANDSAT imagery for mineral exploration in northwest Queensland" has been accepted for presentation at the forthcoming Symposium on Remote Sensing of the Environment organised by the University of Michigan.

Problems

The investigations are being seriously impeded by problems arising from delays over the provision of data products and by poor quality of many of the prints and film negatives received. These are elaborated under Data Quality and Delivery below.

Data Quality and Delivery

Serious problems are being encountered as a result of the long delays over the provision of imagery and the poor quality of the bulk of that received. For northwest Queensland only five frames of day-visible and day-IR prints and negatives of acceptable quality have been received. These are for the months of June, July, September and October 1978 (Table 1). No good quality night-IR cover for this area has, as yet, been received. No thermal inertia data and no computer compatible tapes have been received. For this study area imagery was sought for

May, July, September, November, March and April. The lack of imagery for at least one of the months of March, April and May (and preferably March) is particularly serious as imagery for the season during and after rain is required for comparative studies with the LANDSAT imagery.

The provision of imagery for much of the area of Queensland designated under Area 2 is also disappointing. Only limited day-visible and day-IR cover for part of the area has been received. Imagery for this area was sought on a monthly basis.

Recently, good quality imagery for most months of the year has been received for the area draining into Lake Eyre. This imagery is of very much better quality than that for Queensland. The imagery of acceptable quality which, in this case, includes some night-IR cover, is given in Table 2.

Recommendations

Some modifications of effort are proposed in view of the problems outlined under Data Quality and Delivery above. The thermal inertia data and the computer compatible tapes are required for further work on rock discrimination in northwest Queensland. For southern Queensland and for the drainage basins focussing on Lake Eyre, for which good quality HCMM imagery is available, LANDSAT imagery is required for comparative purposes and for evaluation relative to proposed ground truth investigations. Clearly the HCMM imagery for this area provides a great deal of new information for virtually unmapped territory and every effort to maximise its use is recommended.

Conclusions

For areas for which good quality HCMM imagery is available it provides most valuable new information, notably, on ephemeral and seasonal drainage systems. For studies of these the day-IR cover in particular provides most valuable information.